

Co-processing of Biogenic Feedstocks in Refineries: 1st Work Group Meeting

Transportation Fuels Branch
Industrial Strategies Division

December 13, 2016
Sacramento, CA

California Environmental Protection Agency
 **Air Resources Board**

Agenda

- Welcome and introduction of technical experts
 - ❑ Robert Baldwin (NREL)
 - ❑ Joule Bergerson (Univ. of Calgary)
 - ❑ Helena Chum (NREL)
 - ❑ Corinne Drennan (PNNL)
 - ❑ Jim Rekoske (UOP)
 - ❑ Michael Talmadge (NREL)
 - ❑ Michael Wang (ANL)
- Staff presentation
- Panel member presentations
- Discussions with stakeholders
- Next steps

Objectives of the Work Group

- Evaluate greenhouse gas emissions of co-processing operations and corresponding carbon intensities of final product streams
- Understand drivers of the renewable fractions in finished fuel streams
- Develop guidelines to facilitate certification of carbon intensity for biogenic feedstock derived renewable product streams
- Explore operational and institutional challenges of co-processing biogenic feedstocks in process units such as fluid catalytic crackers and hydrotreaters

Objectives (cont.)

- Identification of technology barriers and potential solutions to incent co-processing deployment
- Compare best practices for co-processing modeling and quantification to inform the Low Carbon Fuel Standard program
- Evaluate the potential of co-processing to contribute to California's climate goals
- General knowledge sharing, discussions and research collaboration among stakeholders

Typical refinery co-processing

- Vacuum Gas Oil (VGO) in Fluid Catalytic Cracking Units (FCCs) with biogenic feedstocks
- Middle distillates in hydroprocessing units with biogenic feedstocks
- Refinery complexity may dictate specific process units being considered for co-processing
- Typical feedstocks likely to be used include bio-intermediates (e.g., pyrolysis oil), vegetable oil, tallow and used cooking oil

Other opportunities for co-processing

- The LCFS regulation currently includes a provision for the use of renewable hydrogen in refineries
 - ❑ Potential for H₂ from Renewable Natural Gas (RNG) as a feedstock in co-processing
 - ❑ Approaches to estimating carbon intensities for co-processing using renewable hydrogen

Critical issues related to co-processing

Renewable volume quantification

- Mass-balance approach?
 - ☐ Extrapolate pilot scale data to commercial scale
 - ☐ Quantifying mass of renewable fuels based on the mass of biogenic input
 - ☐ Consider only net hydrocarbon content of biogenic feedstock
- C¹⁴ isotopic analysis (EPA proposal)?

GHG emissions quantification

- GHG emissions
 - ☐ What energy consumption data to consider (refinery system boundary)?
 - ☐ Co-product allocation: refinery level or process unit level?
 - ☐ Feasibility of modeling energy consumption and associated GHG emissions using publicly available refinery models?
 - ☐ Accounting for additional hydrogen use and energy consumption

Tracking, monitoring and verification

- Chain of custody verification for feedstocks and renewable fuels
- Traceability of renewable content and verification
- Reporting and record keeping requirements
 - ☐ Finished fuel producer
 - ☐ Biogenic feedstock producer

Other critical issues

- Feedstock storage and handling
- Catalyst activity and reactor integrity
- Impact of scale and operating conditions
- Water and oxygen in feedstock

LCFS pathway applications

- ARB has approved prospective pathways for Ensyn Corporation. Pyrolysis oil is co-processed to renewable gasoline and diesel with CIs ranging between 21-27 g/MJ
- A new co-processed renewable fuel application submitted in Q4, 2016
- Other applicants have discussed similar co-processed renewable fuel applications

Panel member presentations

Questions?

Stakeholder presentations?

Next steps

- Additional work group meetings
 - ☐ February 7, 2017
 - ☐ April 4, 2017
 - ☐ June and August 2017
- Draft white paper on co-processing
- For discussion at the next meeting
 - ☐ Propose LCA methodologies for co-processing
 - ☐ Consider approaches to quantification
 - ☐ Explore modeling to support quantification and CI estimation

Next steps

- Stakeholder inputs requested on:
 - ☐ Potential process units for co-processing
 - ☐ Specifics on H₂ derived from RNG in co-processing
 - ☐ Are there data from trial production runs?
 - ☐ New research reports on quantification?
 - ☐ Proposed quantification methods
 - ☐ Technological barriers to deployment of co-processing
 - ☐ Challenges to reporting and verification of finished fuel
 - ☐ Other comments to assist with objectives of this work group

Feedback

Feedback related to Co-processing Work Group Discussions
should be sent to:

LCFSworkshop@arb.ca.gov

by January 16th, 2017

Presentations available at:

http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/lcfs_meetings.htm